



S&P Global
Mobility

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Securing Recycled Auto Materials Under the Revised EU ELV Directive

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Executive Summary

The End-of-Life Vehicles (ELV) Directive in the European Union mandates that by 2030, 25% of plastics in new vehicles must come from recycled sources, particularly closed-loop systems. As the automotive industry shifts toward a circular economy, however, achieving these targets presents challenges, including vehicle material degradation, contamination, and a current reliance on open-loop recycling.

ELV management is a key concern; More than six million vehicles reach the end of their life annually in the EU, but many are underreported due to deregistration discrepancies and grey market activities.

While the European Parliament has introduced adjustments to the ELV targets—signaling ongoing regulatory refinements as policymakers balance ambition with feasibility—improving ELV recycling remains a challenge.

S&P Global Mobility's forecast reveals national trends in ELV supply in the EU, with regulations and market dynamics having varying impact. Over the next 6 years, increased plastic content in electric vehicles as well as sustainability targets will drive demand for closed-loop recycled plastics. Still, anticipated ELV supply shortfalls will create a significant gap in the circular economy.

French automaker Renault offers a successful case study in circular economy initiatives, with best practices including dedicated business units, financial targets and innovative facilities. They also showcase strategic levers for industry readiness, such as collaboration with recyclers, design-for-recycling standards and consumer incentives for ELV returns.

As the automotive sector moves toward electrification, effective ELV management is crucial. The EU ELV Directive emphasizes that sustainability encompasses not only emissions reductions but also material circularity. Companies proactively engaging in these areas will enhance their competitiveness and compliance.

In conclusion, while the transition to a circular economy poses challenges, opportunities abound for innovation and leadership in sustainability. S&P Global Mobility supports industry leaders in navigating these changes with data-driven insights and strategic guidance.

1

Regulation meets reality: Why targets are harder than they look

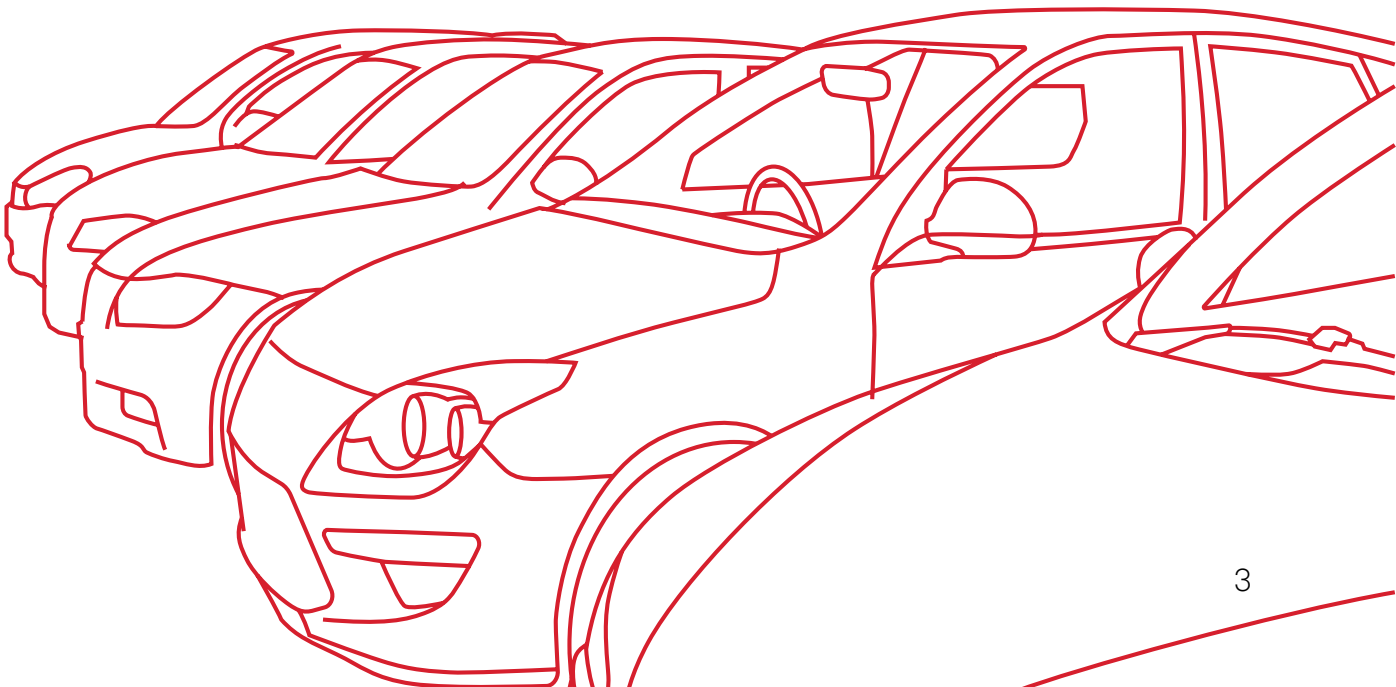
The European Commission's proposed revision of the End-of-Life Vehicles (ELV) Directive represents a major step toward sustainability in the automotive industry. By 2030, manufacturers must ensure that 25% of the plastic used in new vehicles comes from recycled sources, with at least 25% of that originating from closed-loop systems. In a closed-loop system, plastics must be recycled back into automotive-grade applications rather than repurposed for other industries.

This initiative sets a clear regulatory pathway for a circular economy in vehicle production but poses complex challenges. The primary technical hurdle is that recycled plastics often degrade during each recycling cycle, reducing their mechanical properties such as strength and durability.

For example, polypropylene (PP), a widely used plastic in vehicles, loses 15%-20% of its tensile strength after just one recycling pass. Additionally, even if ELVs were fully recovered, only a fraction of the extracted plastics would meet the high-performance standards required for automotive applications. Contamination compounds the issue, as ELV plastics are often mixed with adhesives, coatings or other polymers, making sorting and purification processes costly and technically demanding.

Many automakers have now turned to open-loop recycling, incorporating post-consumer materials, i.e. discarded products or packaging that have fulfilled their intended use by consumers such as polyethylene terephthalate—or PET—bottles into non-structural vehicle components including carpets and insulation. However, this approach does not contribute to the closed-loop recycling target outlined in the directive.

The European Parliament has discussed adjustments to these targets, signaling ongoing regulatory refinements as policymakers balance ambition with feasibility. While the final framework may evolve, the core challenge remains: the automotive sector must scale up solutions that enhance both the supply of ELV plastics and the efficiency of automotive-grade recycling.



2

Unfolding EU ELV supply predicament

Status quo of EU ELV supply

Managing the supply of ELVs remains a pressing challenge in the European Union. According to Eurostat, more than six million vehicles reach the end of their life annually, yet the actual number of ELVs is often underreported owing to discrepancies between deregistered vehicles and those formally entering the recycling network.

About one-third of deregistered vehicles never make it to official dismantling facilities. This discrepancy is primarily due to used car exports and the presence of a grey market for ELVs.

Exports of unroadworthy used cars:

Many vehicles that are no longer roadworthy in the EU are exported, particularly to Africa and Asia, where import restrictions are less stringent. The latest EV incentives have also fueled used vehicle exports within the EU, thanks to its associated condition of scrapping the old vehicles within the region. However, the lack of regulatory oversight in certain regions means these exported vehicles continue to pose environmental and safety risks.

Grey-market activities:

Informal dismantling and resale of used vehicle components contributes to significant ELV tracking challenges. Vehicles dismantled outside regulated facilities often bypass depollution protocols, with spare parts sold on black markets through online platforms. Additionally, illicit activities such as money laundering and the illegal trade of precious metals from catalytic converters and particulate filters further complicate ELV traceability.

Drivers of future EU ELV supply

In the medium term, strong used vehicle exports will continue to impact ELV stocks in the EU. Without mandatory scrappage regulations for aging vehicles, EV incentives alone cannot curb these exports of ELV to regions outside of EU, particularly from fleet and rental car companies. However, stricter export controls will emerge during 2027–29, limiting the outflow of low-quality used vehicles. The revised ELV Directive will introduce roadworthiness tests for exported vehicles to prevent the export of end-of-life cars and promote recycling within the EU.

In the long term, the global used car market will shift, with China increasing its market share. This shift will reduce the dominance of traditional European exporters and, in turn, lead to a higher accumulation of ELVs within the EU. By 2030, as older vehicles phase out of circulation, we expect the volume of ELVs in the region to rise significantly.

Forecasting EU ELV supply: A data-driven approach

To navigate these evolving trends, S&P Global Mobility has developed a robust methodology to estimate and forecast ELV volumes across key EU markets. By analyzing vehicles in operation (VIO) by year of first registration, assessing used car export rates, and incorporating natural vehicle survival rates based on empirical modeling from European transport research, we provide a granular understanding of ELV supply in EU.

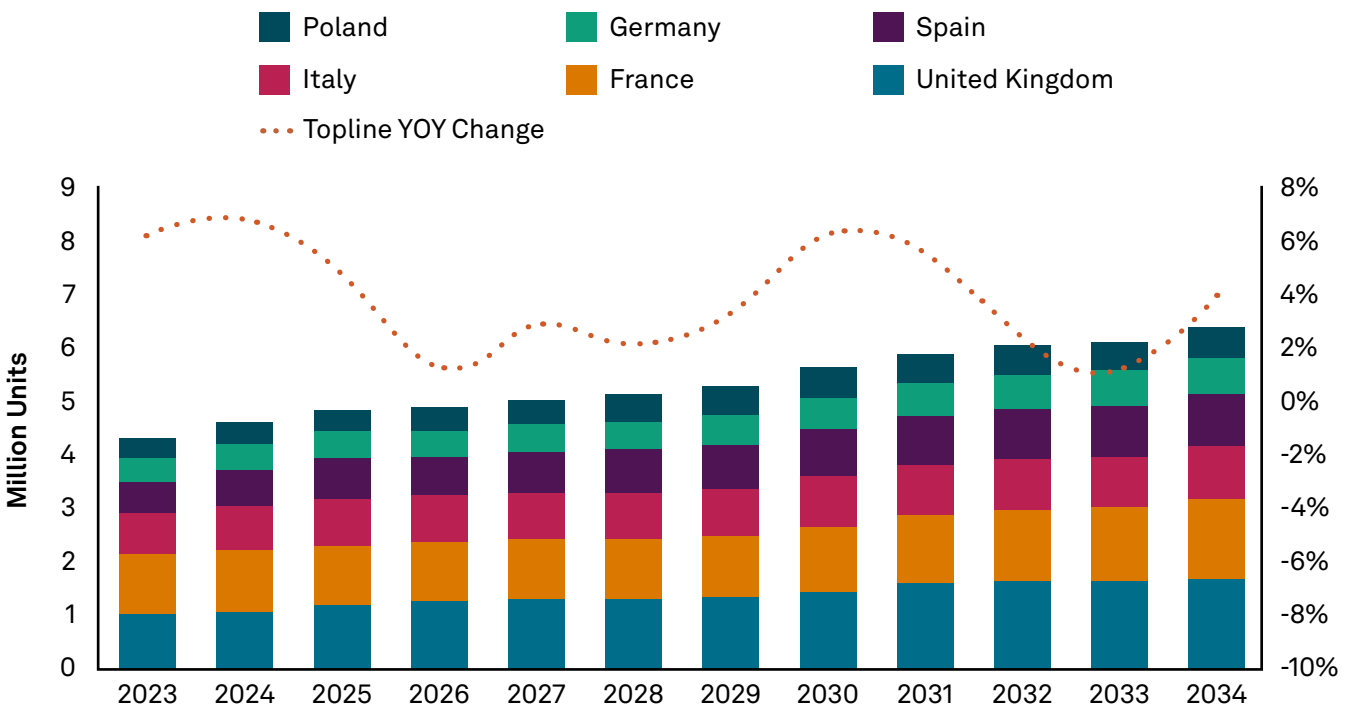
Key findings from our forecast reveal distinct national trends:

- **Markets with high ELV growth:** Country A and country B will continue to be the largest ELV contributors, with each generating over one million ELVs annually due to strong EV incentives and aging VIO. Country F, as a leading importer of used vehicles, will also face rising ELV volumes, especially as stricter CO₂ regulations limit the circulation of older vehicles.
- **Markets facing ELV deficits:** Country E, despite its size, will remain a major used car exporter, limiting its domestic ELV volumes. A younger VIO, largely shaped by company car policies, will also contribute to this trend. Meanwhile, Country C, despite having an aging vehicle fleet, will continue to struggle with illegal dismantling due to weak enforcement of ELV regulations.

These two trends of ELV growth or deficit are influenced by a combination of regulatory frameworks, economic conditions and market behaviors:

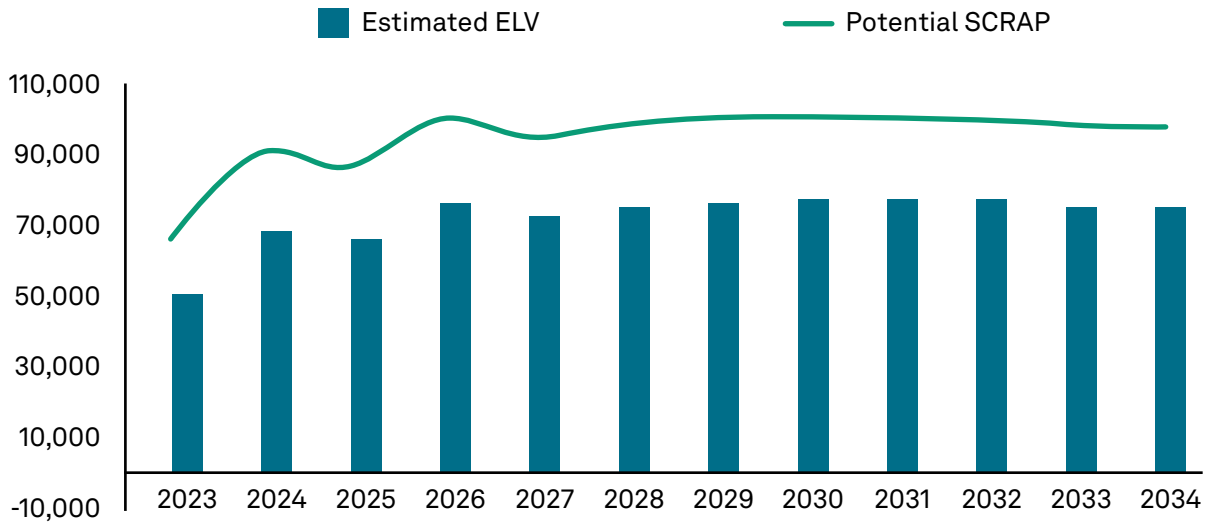
- **Regulatory impact:** Countries with strict ELV regulations and enforcement register higher official ELV volumes, while lax oversight enables grey-market activity.
- **Market dynamics:** A preference for newer vehicles in certain markets leads to high turnover rates, reducing ELV accumulation but strengthening used car exports.
- **Economic influence:** Economic uncertainty often leads to prolonged vehicle ownership, aging the VIO and delaying ELV generation.

End-of-Life-Vehicles (ELV) Top-Line Forecast by Country



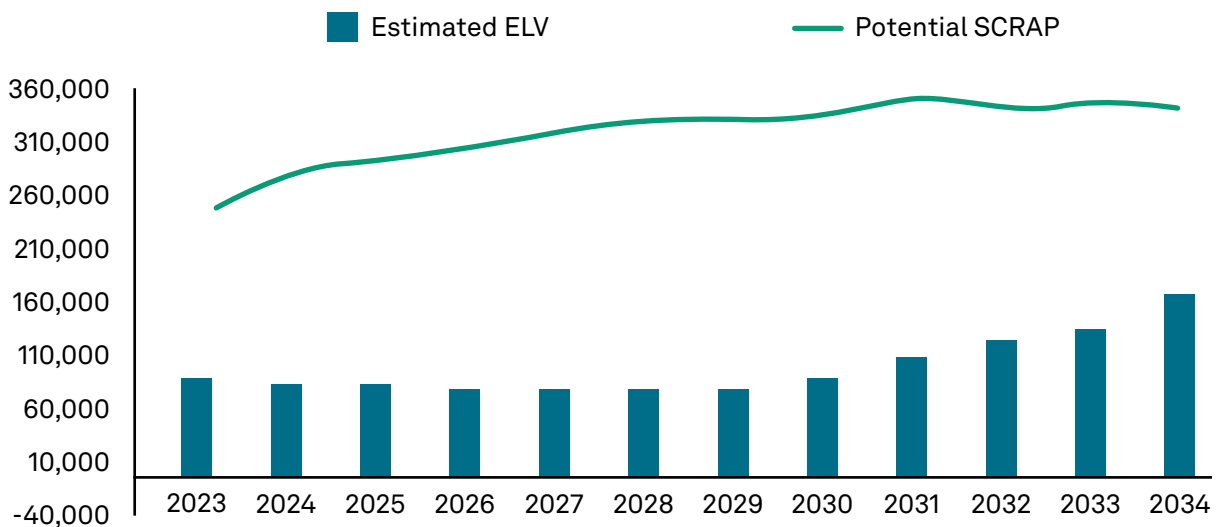
Data compiled 02 28, 2025.
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Brand X Estimated ELV vs Potential Scrappage with Natural Survival Rate Poland



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Brand X Estimated ELV vs Potential Scrappage with Natural Survival Rate Germany



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The import and export of used cars also creates a gap between the natural scrappage rate and the ELV number effectively treated in a recycling network. For example, Germany, Europe’s top used car exporter, maintains a relatively young VIO with an average age of 11 years. Meanwhile, Poland, a key importer of aging vehicles, faces mounting ELV volumes as these cars near the end of their life cycle but are not all recycled in structured networks.

3

Mapping the closed-loop recycled material supply-demand chasm

EU ELV Directive: The push for closed-loop recycling

The revised EU ELV Directive mandates that 25% of plastics in new vehicles be recycled, with at least 25% of that sourced from closed-loop systems. While the current focus is on plastics, future regulatory developments may extend similar closed-loop requirements to materials like steel and aluminium, reinforcing the EU's broader circular economy ambitions. Although S&P Global Mobility has assessed the supply and demand of various types of materials, in this study we focus only on plastic.

Focusing on plastic

Plastics pose unique challenges for same-grade recycling due to material degradation, contamination and limited reuse potential in high-performance automotive applications.

A typical car contains 208 kg of plastic, yet only 19% of ELV plastics are recycled, with most ending up in landfills or incineration. While recycled PP and high-density polyethylene (HDPE) account for 25%-30% of some components, only about 12% of ELV plastics are currently recycled into automotive-grade materials — well below regulatory targets.

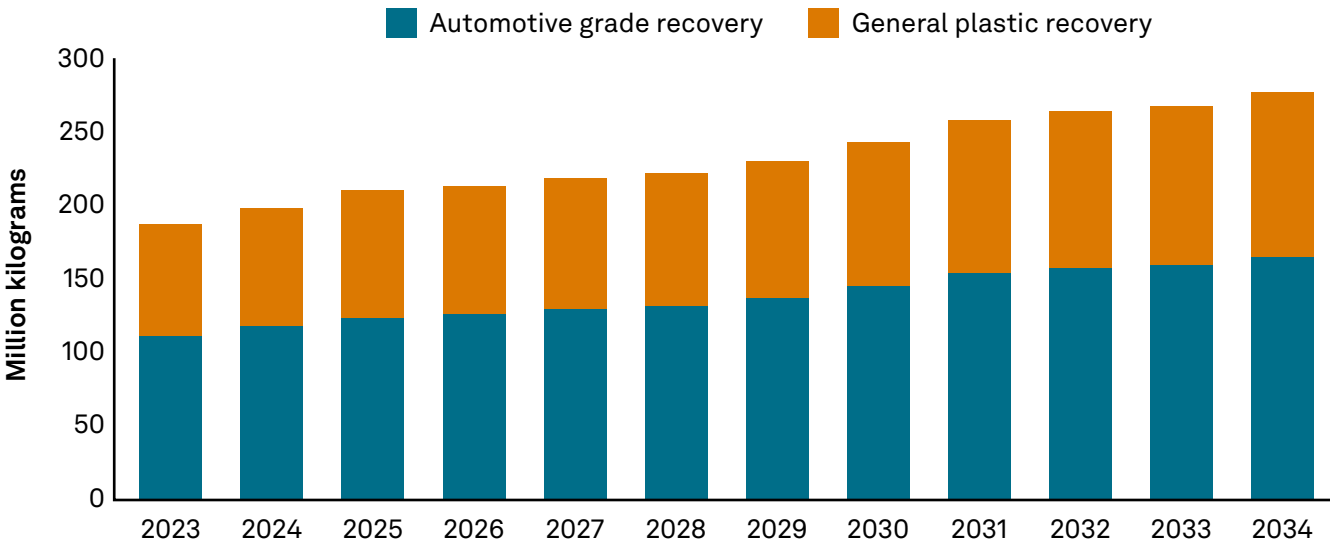
Projected ELV closed-loop recycled plastic supply

Using S&P Global Mobility's ELV supply forecast (available to clients by request), we estimate the availability of automotive-grade recycled plastics based on current recovery rates.

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ELV plastic recovery forecast

Projected closed-loop recycled plastic supply from ELVs



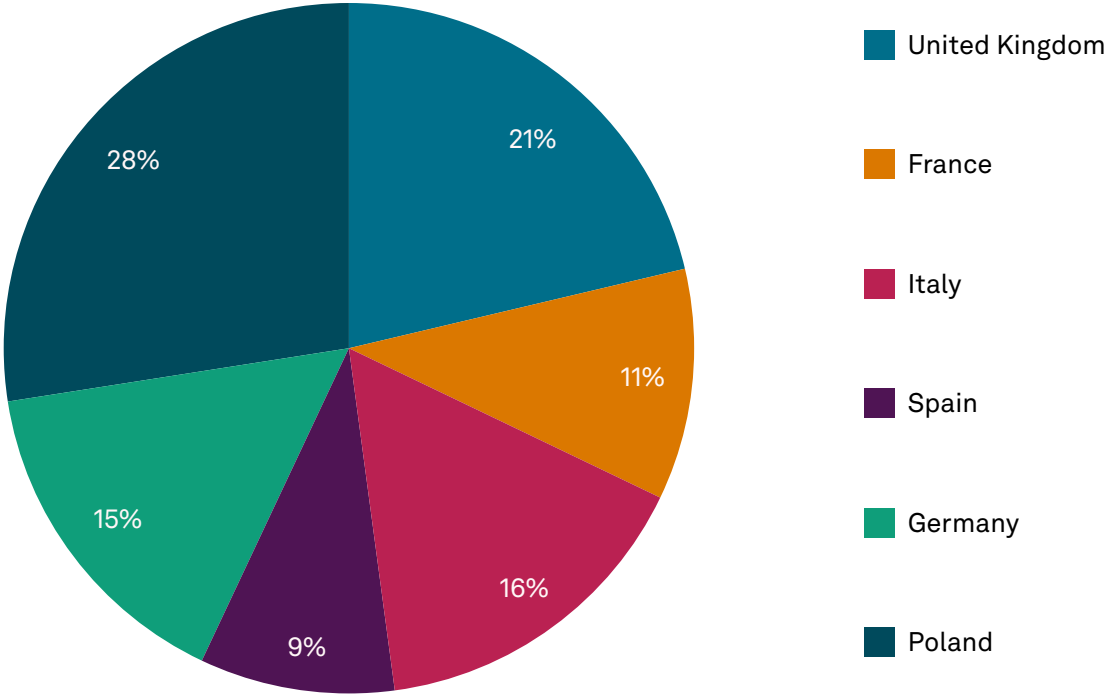
Data compiled 02 28, 2025.

Total ELV plastic recovery from 6 EU countries

Source: S&P Global Mobility

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ELV Plastic Automotive Grade Recovery Forecast 2023 - 2034 Aggregated Country Supply



Data compiled 02 28, 2025.
 Total ELV plastic recovery from 6 EU countries
 Source: S&P Global Mobility
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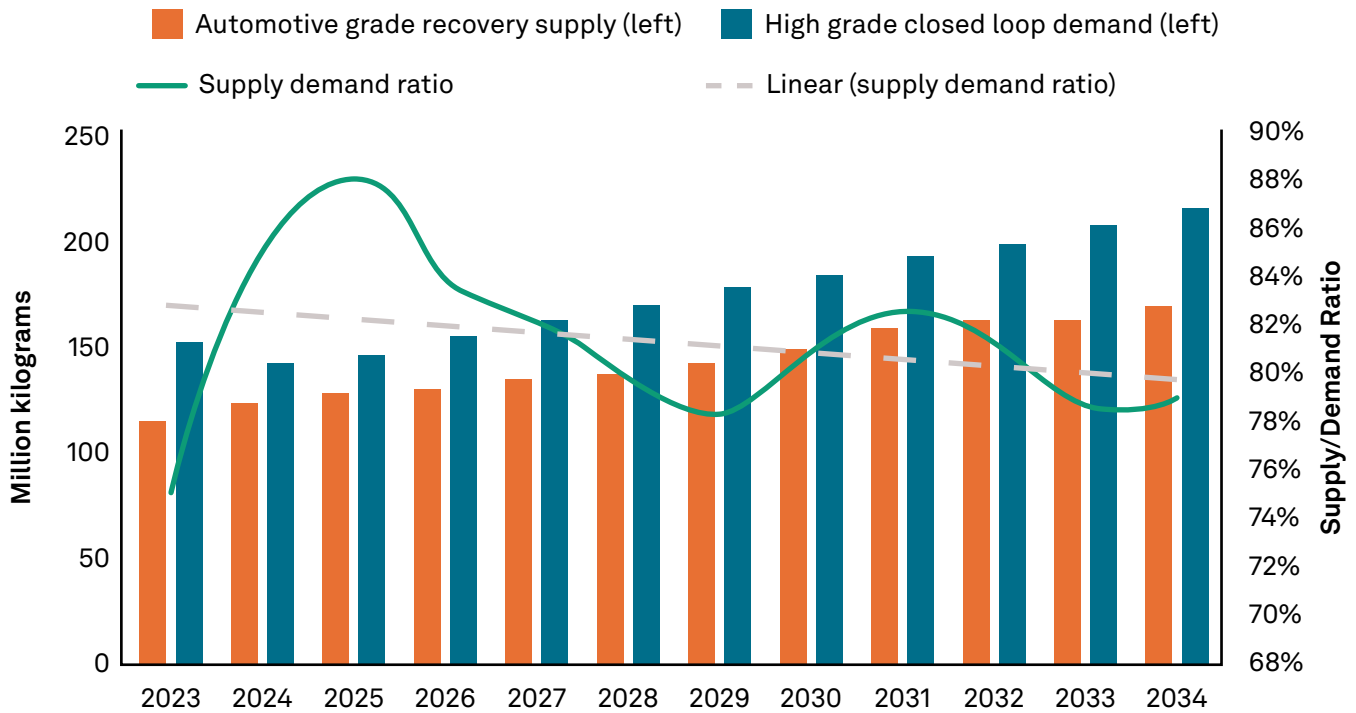
KEY FINDINGS:

- Overall plastic recovery from ELVs in the six researched EU countries will increase from 190 million kg in 2023 to 282 million kg in 2034, reflecting a compound average growth rate (CAGR) of 2.9% during this period. After 2030, we anticipate plastic recovery from ELVs to gain momentum, primarily due to the expected increase in ELV stocks resulting from foreseeable regulations on exporting non-roadworthy used cars and the rising plastic content in ELVs driven by lightweighting trends.
- However, material degradation and mechanical property changes during each recycling process qualifies a maximum of 60% of the ELV plastic to loop back into automotive component productions. Whether the supply will gain momentum depends on the industry’s technology breakthrough, especially toward pre-treatment sorting and chemical recycling.
- Analyzing country-level ELV automotive-grade recovery, the distribution remains uneven. Poland accounts for 28% of the total supply, ranking first in automotive-grade recovery throughout the forecast horizon of 2023–34 due to its aging VIO and a larger ELV pool than peer markets. In contrast, France, despite being a significant production hub, expects only limited supply among the six countries, given its younger VIO age and brand-level plastic utilization.

Projected closed-loop recycled plastic demand in the context of supply

Using S&P Global Mobility’s **Light Vehicle Production Forecast** and supply chain material forecast, the increasing plastic content in EVs, original equipment manufacturer sustainability targets and the growing emphasis on lightweight materials will boost demand for plastics. According to the latest draft of the EU’s ELV Directive, a vehicle with a higher plastic content raise demand for closed loop recycled plastic.

ELV plastic supply & demand analysis EU 6 Countries Total



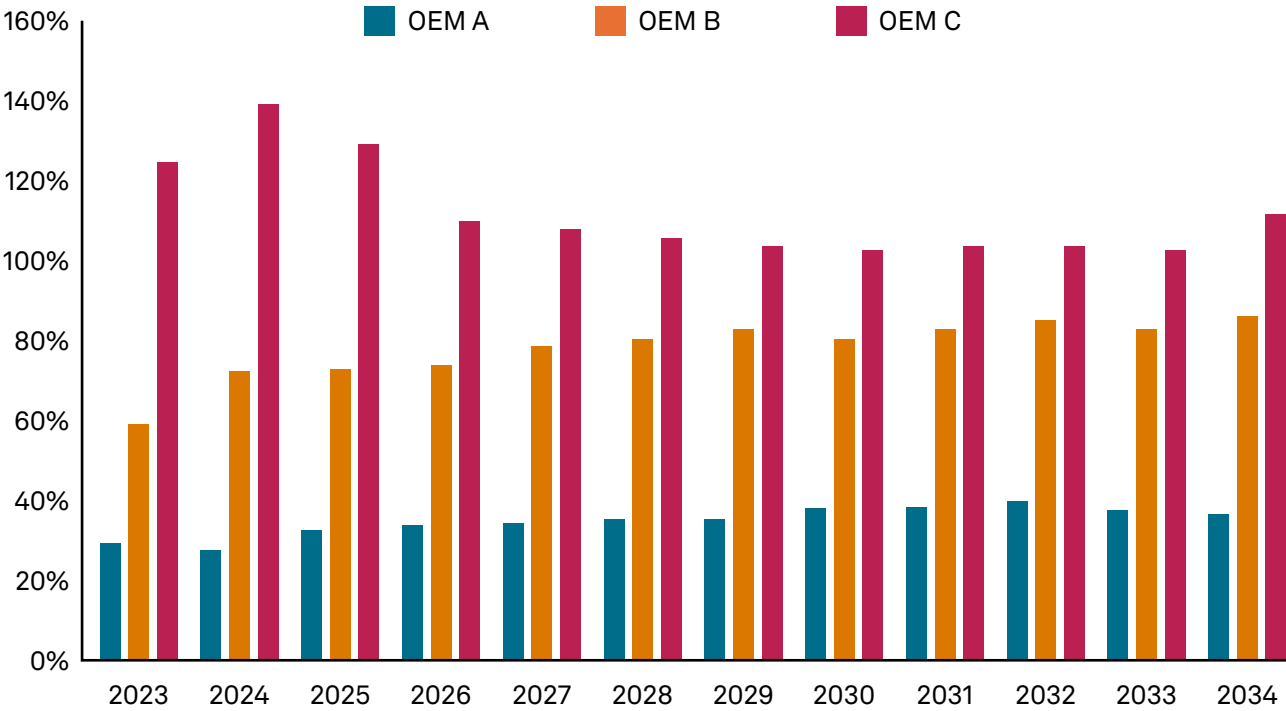
Data compiled 02 28, 2025.
 Total ELV plastic recovery from 6 EU countries
 Source: S&P Global Mobility
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KEY FINDINGS:

- During 2023–34, we estimate high-grade closed loop plastic demand of the six researched countries to increase from 151 million kgs to 214 million kgs, reflecting a CAGR of 3.2% for the period. Note the estimates for demand before 2030 rely on a voluntary basis as the current version of EU ELV Directive mandates compulsory implementation after 2031.
- This study focuses on 2023–34. We anticipate closed-looped recycled plastic demand will rise, due to increased production of EVs and the foreseeable hike in regulatory requirements.
- However, limited growth of high-grade recovery supply will cause a clear market shortage. The high-grade recovery ELV plastic supply and demand ratio in the six researched countries will remain below 100% throughout the forecast horizon, and the supply shortage will further exasperate from 2023 to 2034.

OEM level ELV plastic high-grade recovery supply demand ratio

Exemplary results of 3 OEM groups



Data compiled 02 28, 2025.
 Total ELV plastic recovery from 6 EU countries
 Source: S&P Global Mobility
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KEY FINDINGS:

- OEM-level gaps:** A significant variance exists in the OEM-level ELV plastic high-grade supply and demand ratio. The supply-demand ratio of the three researched OEMs ranges from severely short of supply—approximately 35%—to a slight oversupply of about ~110%.
- Import and export proximity:** OEM A, a leading traditional premium brand, exports a large share of EU-produced vehicles to various markets outside the region meaning many EU-manufactured vehicles become ELVs in non-EU regions. In contrast, OEM C has limited production in the EU and a surplus of end-of-life light commercial vehicles, resulting in a slight oversupply of high-grade recovery for ELV plastics.
- VIO age:** OEM A, one of the most popular used car brands, often exports used cars to regions outside the EU. S&P Global Mobility’s **proprietary VIO datasets** show a younger average fleet age than the market average, causing relatively low feedstock of the brand’s ELV in the market. Nevertheless, according to the **Mobility Light Vehicle Forecast**, EU will remain the biggest production hub of this OEM and it will continue with a production scale of more than 1 million units until 2034, further contributing to the supply shortage of closed-loop recycled plastic.

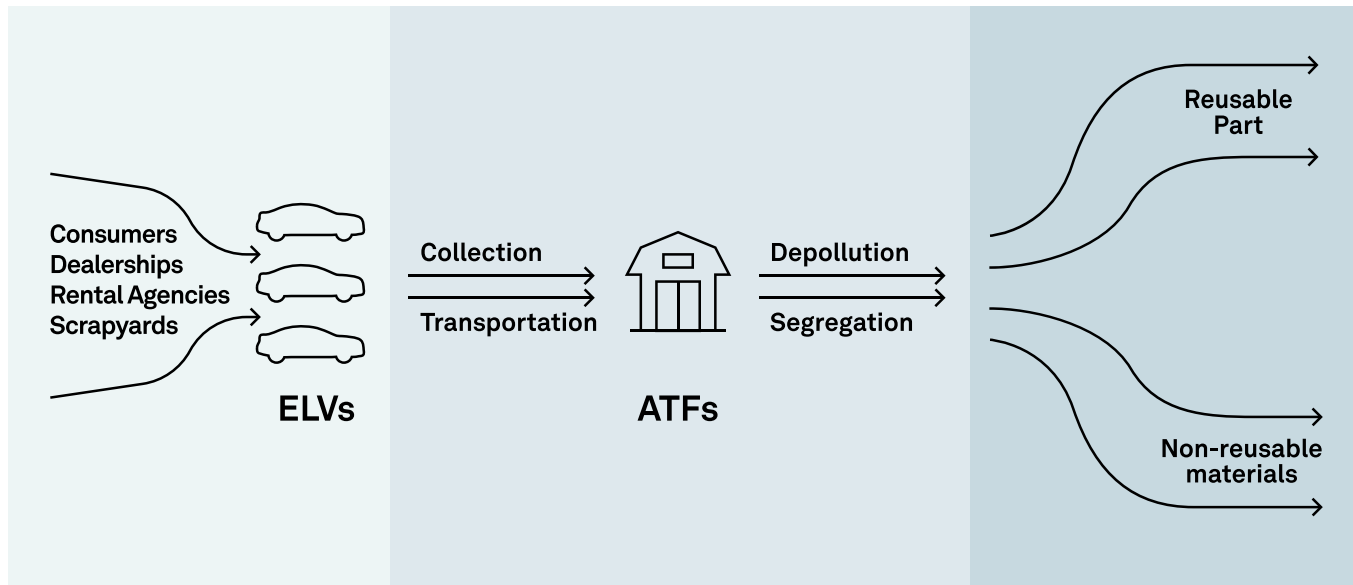
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Unlocking end-of-life recycling ecosystem

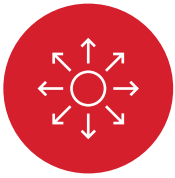
The end-of-life recycling process in the EU comprises several interconnected stages that are crucial to effective recycling with minimal environmental impact. The first phase involves the collection of ELVs from various sources, including consumers, automobile dealerships, rental agencies and scrapyards. Strategically established authorized treatment facilities (ATFs) and designated collection centers across the EU facilitate efficient collection and transportation of ELVs.

Collected ELVs then undergo a depollution process to remove hazardous substances and prevent environmental contamination. The system must adhere to stringent EU regulations to ensure the safe handling and disposal of hazardous materials.

Following depollution, vehicles are systematically dismantled to isolate reusable parts from non-reusable materials. Usable components are salvaged for resale, refurbishment or reuse, extending their life cycle and contributing to resource efficiency. Metals, plastics and glass are separated to facilitate their respective recycling processes.



The ELV value chain in the EU is a dynamic and evolving system characterized by many unique factors:



Fragmented

The value chain is highly fragmented due to the decentralized nature of various players involved in this complex process, exacerbated by significant disparities across countries and regions. According to S&P Global Mobility's research, dismantlers in Italy primarily consist of small-scale, local operators rather than international companies, contributing to the fragmentation.

In contrast, in countries like France and the UK, the top three dismantlers hold significant power with over 50% of market share. This can result in inconsistencies in recycling practices and standards, making it challenging to achieve uniform compliance with EU directives and establish standardized recycling processes.



Diversified revenue

Companies within the ELV value chain generate revenue from multiple sources, including the sale of recovered materials, resale of reusable parts, and provision of dismantling and recycling services. Diversified income streams help businesses withstand market fluctuations in specific sectors, such as changes in raw material prices or demand for used parts.



Consolidation trends

The need for economies of scale, improved operational efficiency and enhanced compliance with strict regulatory requirements is driving a noticeable trend toward consolidation within the ELV sector. Larger companies can invest in advanced technologies and streamline operations, resulting in higher efficiency and better resource utilization. This consolidation may result in fewer but more dominant players within the market.



Highly regulated

The ELV sector faces strict regulations at both the EU and national levels, primarily governed by the ELV Directive. Anticipated updates and stricter regulations to the ELV Directive will create barriers to entry for new players and improve the overall coverage and aspects of ELV treatments in the EU.



National and regional disparities

Significant gaps exist within the EU regarding the infrastructure, technology adoption and compliance levels in the ELV value chain. France, with its advanced recycling infrastructures, demonstrates higher efficiency and better compliance with EU directives compared with countries like Italy and Spain, which face challenges in meeting the EU's targets.

In addition, regional disparities are evident. In Spain, research indicates that advanced infrastructure is more concentrated in the Catalonia and Galicia regions. This situation presents opportunities for investment in underdeveloped regions to improve their recycling capabilities and align them with more advanced areas.



Collaborative network

ELV dismantlers often join regional associations to exchange information on regulatory changes, technological advancements and market trends. The associations help facilitate knowledge sharing, advocacy and the development of best practices. Additionally, they serve as a collective voice for their members, playing a key role in shaping the industry's future.



Technology for EVs

The increasing prevalence of EVs introduces unique challenges to the ELV value chain, particularly in the recycling of EV batteries and electronic components. The sector is adapting through specialized technologies and processes tailored to the dismantling and material recovery from EVs.

5

Case study: Renault's bid to control its destiny

Renault has emerged as a pioneer in the automotive industry by effectively embracing the circular economy through strategic initiatives. By establishing a dedicated business unit, setting ambitious financial targets and pioneering innovative projects like the Flins Refactory, Renault is enhancing its sustainability efforts and positioning itself for long-term success in a rapidly evolving market.

The company's focus on shared mobility further demonstrates its commitment to maximizing vehicle utilization while minimizing environmental impact. The following best practices and key insights illustrate how Renault is navigating this transformative landscape.

1. **Establish a dedicated business unit:** Renault's creation of a dedicated business unit for circular economy operations demonstrates the importance of focused leadership in driving sustainability initiatives. This structure allows for specialized management and strategic alignment with circular economy goals.
2. **Set clear financial targets:** By establishing aggressive financial targets, Renault demonstrates that sustainability and profitability can go hand in hand. Clear objectives help to measure progress and ensure accountability within the organization.
3. **Invest in innovative facilities:** The Flins Refactory serves as a pioneering model for integrating circular economy principles into automotive operations. Investing in facilities that focus on refurbishment and recycling can significantly extend product life cycles and reduce waste.
4. **Promote shared mobility:** Renault's emphasis on shared mobility as a strategic lever highlights the potential of collaborative consumption to enhance vehicle utilization. By fostering car-sharing and ride-sharing services, automotive manufacturers can reduce their environmental footprint while meeting consumer demands.
5. **Engage with external stakeholders:** Attracting external investments for circular economy initiatives is crucial for scaling operations. Collaborating with other automotive players and stakeholders can enhance innovation and resource sharing, leading to more effective circular economy solutions.
6. **Launch dedicated recycling and remanufacturing factories and acquire ELV network chains:** Renault has dedicated trained technicians and the factory floor to work on reconditioning used vehicles and retrofitting. Renault intends the new business wing to generate €1 billion in revenue by 2030.
7. **Adapt to market dynamics:** Renault's proactive approach to embracing the circular economy reflects the need for automotive manufacturers to adapt to changing market conditions and consumer preferences. Staying ahead of trends can provide a competitive advantage and foster long-term sustainability. Renault has also partnered with dismantling companies to form joint ventures to work together with the ELV network, ensuring a smooth flow of recycled materials to meet its supply.

By implementing these best practices, Renault not only enhances its operational sustainability but also sets a benchmark for other players in the automotive industry to follow.

6

Strategic levers for industry readiness

As the automotive industry moves toward compliance with the EU ELV Directive, proactive measures will be essential in overcoming regulatory and technical hurdles. While challenges such as material degradation, contamination and supply constraints persist, several strategic levers can help navigate these complexities and build a more resilient, circular supply chain.

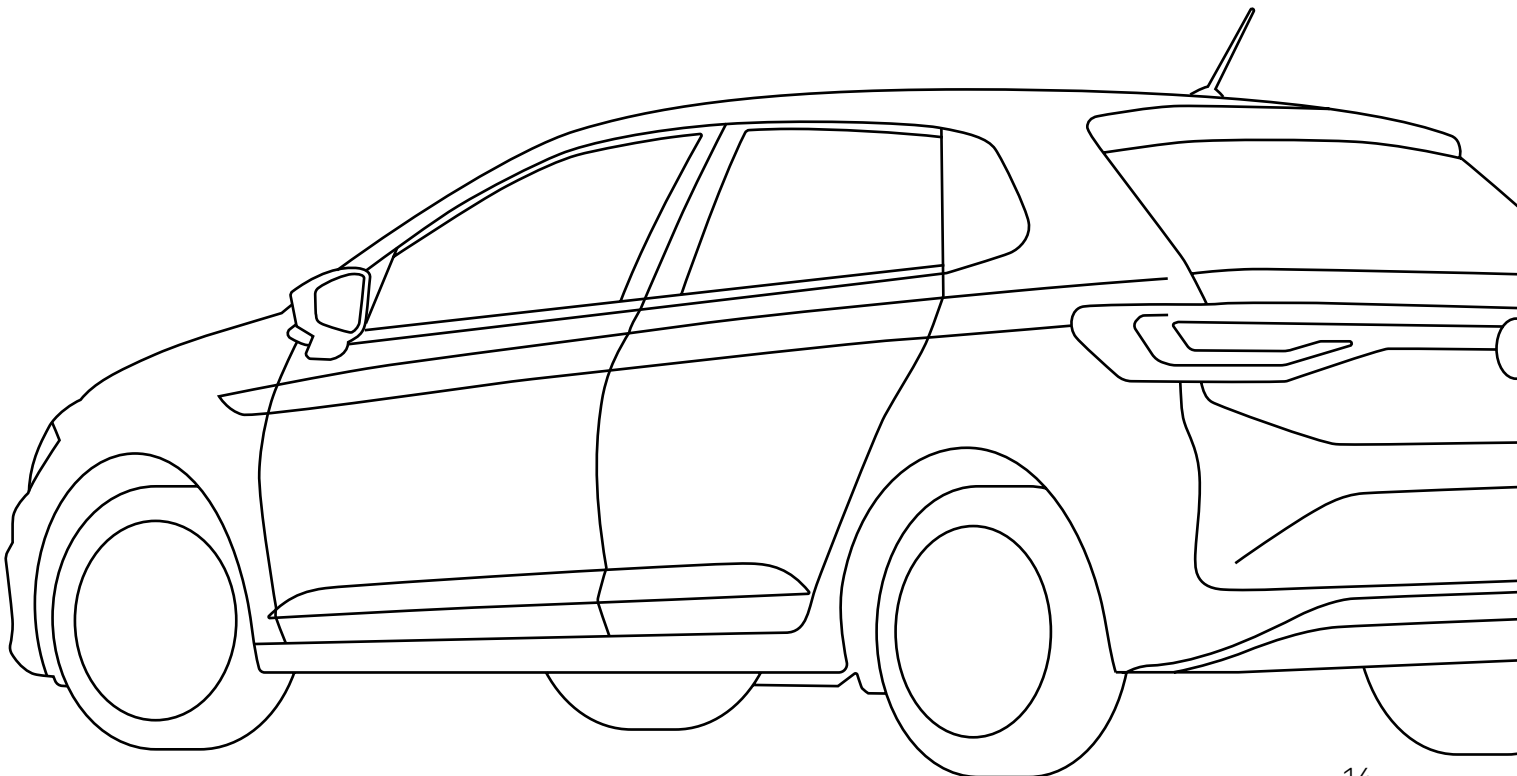
A key enabler is collaboration with recyclers to ensure a steady supply of high-quality, automotive-grade recycled plastics. Partnerships, such as Volvo's alliance with Stena Recycling, demonstrate how coordinated efforts can enhance the recovery and refinement of ELV materials, ultimately securing a more stable pipeline of compliant secondary materials.

Beyond individual partnerships, pre-competitive material-pooling alliances offer a way for automakers to collectively tackle supply shortages. Initiatives like the Catena-X Automotive Network, where BMW, Mercedes-Benz and Volkswagen trace and pool recycled plastics and exemplify how industry-wide cooperation can drive efficiency and regulatory compliance.

Beyond supply chain improvements, automakers must integrate design-for-recycling standards during product development. Reducing material complexity, using standardized polymers and minimizing adhesives can significantly enhance the recyclability of ELV components.

Additionally, consumer incentives for ELV returns — such as buyback programs or trade-in bonuses — can boost collection rates, ensuring a consistent feedstock for recycling initiatives.

Finally, secondary material futures contracts can help manufacturers hedge against supply fluctuations and price volatility in the recycled materials market. By securing future access to high-quality secondary plastics, OEMs can mitigate risks associated with regulatory uncertainty and fluctuating raw material availability.



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The road ahead: ELV strategy cannot be an afterthought in EV transitions

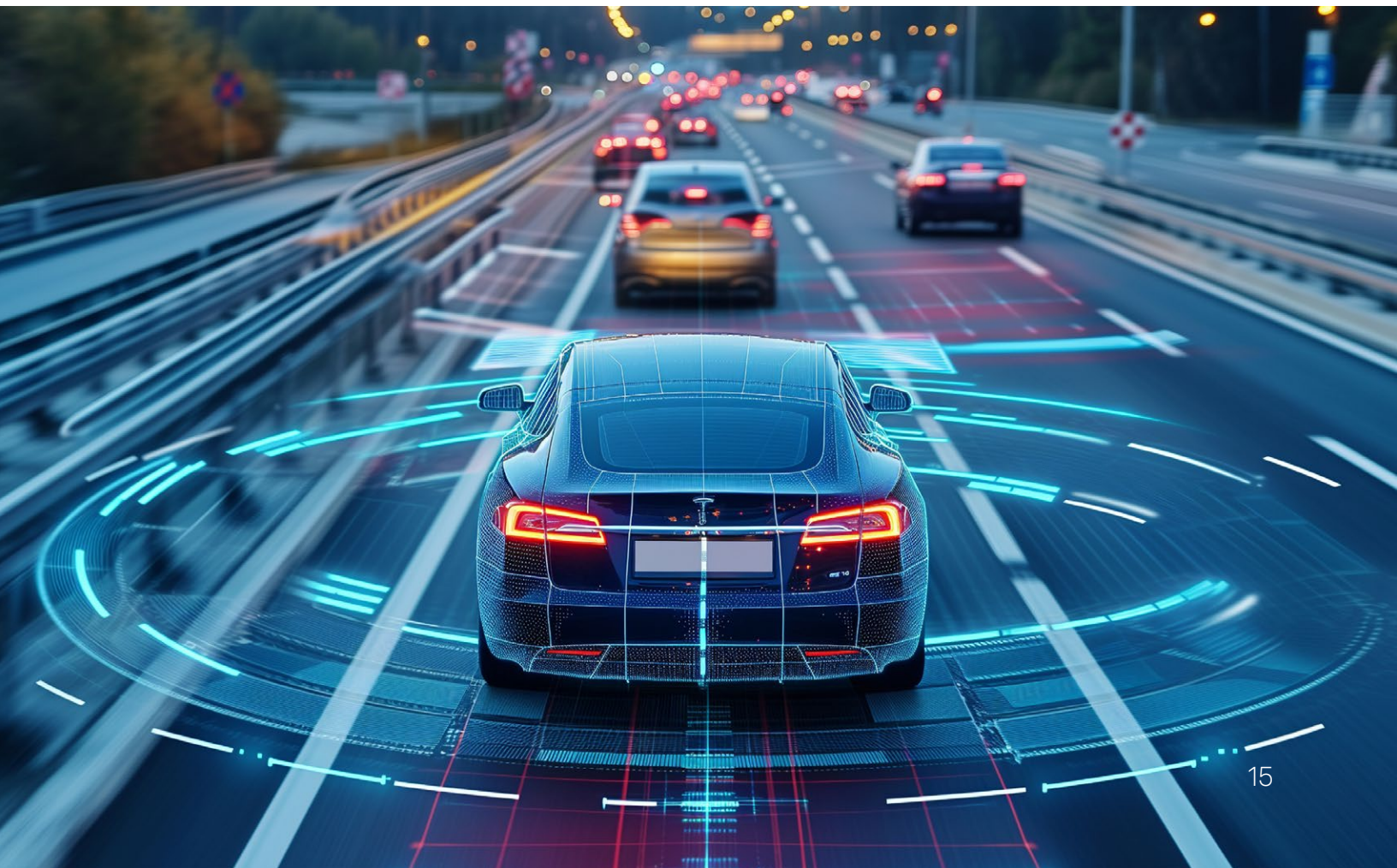
As the industry moves toward electrification, ELV management must remain a priority. The new EU ELV Directive emphasizes that sustainability goes beyond emissions reduction — circularity in materials and recycling is now a strategic imperative.

Proactive engagement in closed loop recycling, cross-industry collaboration and design-for-recycling are essential to securing regulatory compliance and long-term competitiveness. Companies that act now will gain an edge, ensuring stable access to secondary materials while reinforcing their sustainability commitments.

The challenges are real, but so are the opportunities. S&P Global Mobility has been working with industry leaders to navigate these shifts, offering data-driven insights and strategic guidance. For those ready to turn compliance into advantage, the time to act is now.

S&P Global Mobility offers research and consulting support to help OEMs navigate the circular economy. We cover end-of-life vehicle outlook, ELV material recycling efficiency, regulatory requirements, light vehicle production outlook, and more.

Please email Susanna Huang, Associate Director, Mobility Consulting, at susanna.huang@spglobal.com to inquire.

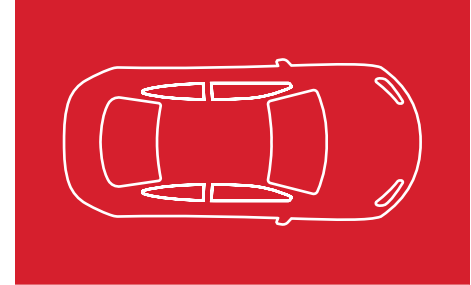


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